

# Western Corridor transportation study

## Travel demand management

18 April 2005



# Travel Demand Management

Prepared for

Greater Wellington Regional Council  
and Transit New Zealand

Prepared by

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## Executive Summary

The Western Corridor Transportation Study is seeking to improve transport connections throughout Wellington's Western Corridor. The study includes a review of potential Traffic Demand Management (TDM) opportunities, with a view to identifying whether these would delay or reduce the infrastructure needs over time and whether this improvement is warranted from a cost/benefit perspective.

A broad range of travel demand management measures have been identified and assessed against travel conditions in the western corridor. This has given rise to a number of specific opportunities that require further assessment and verification in order to implement the recommended package of measures. Further reporting on the package of measures should address the following:

- Detailed nature and impacts of recommended measures;
- Proposed methodology and appraisal of recommended measures;
- Cost estimates, apportionment and implementation of recommended measures.

This report has been prepared following review of the Greater Wellington Regional Council Regional TDM Strategy Issues Paper, dated April 2005, and the Transit New Zealand National TDM Progress Report, dated 22 February 2005.

Analysis of the effectiveness of a major TDM feature scenario, Scenario 1 – TDM and Public Transport, was assessed to be insufficient to address the full needs of the corridor. Therefore TDM will be used to support other infrastructure based scenarios to provide the desired level of peak hour flow below that which the infrastructure investment provides. From the assessment and evaluation of non price TDM measures considered in this report, it is recommended that the final package of measures should include the following:

### Park and Ride

The provision of additional park and ride facilities is considered to significantly decrease spare capacity on rail services based on existing network conditions. Additional parking is thought to be particularly attractive at Kapiti, Porirua and Paremata.

### CBD Parking Restraint

Modelling results from a 20% increase in parking charges indicate that demand for those spaces would remain fairly consistent, from commuter traffic in the Western Corridor. Providing that adequate public transport alternatives are provided it is recommended that long stay parking spaces become less attractive to the commuter, either through availability or through pricing. In this regard, a price increase of over 20% should be considered.

### Bus / Rail Interchange

Improvements to bus / rail interchange should occur through a number of measures, including;

- Traveller information, particularly when there are delays;
- Improved rail reliability (and therefore bus reliability);



- Defined pedestrian thoroughfare (clear movement between modes);
- Improved passenger amenities and facilities;
- Cycle Parking

### **Bus Priority (Feeder Services)**

Where upgraded or new interchanges are planned, bus priority, particularly on feeder services, should be considered. Bus priority measures should include signal priority at intersections, particularly those that access the stations. Bus lanes could be considered on particularly busy roads or where congestion is likely to cause undue delay to buses. One example would be use of HOV lanes in Ngauranga Gorge.

### **Increased Service Frequency**

It is recognised that increased service frequency can add to the attractiveness of a public transport journey and, implemented as part of a package, will help to facilitate new patronage. It is recommended that increased service frequency be looked at as part of the overall improvements to rail / bus interchanges.

### **Workplace Travel Plans**

Workplace travel plans are likely to reduce peak hour movements on the road network. However, the destination for most workplace trips on the Western Corridor is within the CBD. The greatest impact on the Western Corridor would therefore be to have CBD places of employment prepare workplace travel plans. In the current environment, these would be on a volunteer basis. Applying conditions to new places of employment is an option but likely to have a minimal effect that would only have long term impacts. It is therefore recommended that an encouragement mechanism be introduced to persuade existing businesses to prepare and implement plans. A similar approach has been undertaken in Melbourne where large government organisations have been preparing workplace travel plans.

### **High Occupancy Vehicle (HOV) Lanes**

HOV lanes tend to be implemented in congested areas on corridors (such as bridges), where the improved travel time of the lane encourages higher vehicle occupancies and thus reduces the total number of vehicles while not restraining demand. HOV lanes could be implemented in Ngauranga Gorge in conjunction with limited capacity improvements. These lanes may also be able to provide a freight priority through the most congested part of the corridor.

The modelling indicates that application of these measures is likely to have limited effect on the traffic volumes on the corridor. It is expected that a suite of these measures may reduce corridor volumes by up to 5%. The application of these measures would best be trialled on the corridor to determine which are the most effective.

Priced TDM measures have not been considered in this report but it is considered that they will be able to further reduce traffic volumes. Current legislation limits the availability of these measures and changes to legislation are not expected in the next ten years. Toll opportunities should be considered when the infrastructure investment parts of the corridor plan are better established.

## 1 Introduction

### 1.1 Structure and Scope

The first stage of the process included a brainstorm of travel demand management opportunities that may improve, or with other opportunities improve, travel conditions in the corridor. This working paper forms the second stage of the process, by coarse sieving the potential measures (**Section 2**) and suggesting appropriate ways of investigating the impacts of the measures through the Western Corridor transport model (**Section 3**).

## 2 Consideration of potential TDM elements

### 2.1 Overview

It is worth reiterating that Travel Demand Management is the profession of managing or influencing the demand for the travel, not the supply of infrastructure. The difference between Supply Management and Demand Management is often not accurately portrayed. However, for the purpose of this task, demand management, supply management and other factors that affect mode choice (such as travel speeds or traveller information) have been considered at the coarse sieve stage without too much attention to the profession in which they sit – this is considered in more detail at **Section 3**.

The objectives of the measures proposed are to:

- Reduce traffic travelling on SH1 at peak congestion times. This implies a peak spreading approach where the existing infrastructure is more effectively utilised over a longer period.
- Support existing mode split to public transport. Although not an implicit objective of the study or Wellington in general there appears to be a requirement to maintain existing mode split to public transport. Strategies proposed will therefore support a public transport mode split target but will not specifically address mode split as an issue.
- Reduce congestion – any measure that reduces the number of trips on the road network that could delay the upgrade has also been considered.

### 2.2 2016 Base Model Implications/Issues

This section provides an understanding of the key issues for transportation in the corridor to focus the TDM measures towards reasons for their implementation. For example, identifying which sections of the corridor are congested and what the trip purposes are in those areas. Also an understanding of rail demand and capacity, together with which stations are key to the corridor will also help to better understand where to focus initiatives.

#### Traffic Volumes

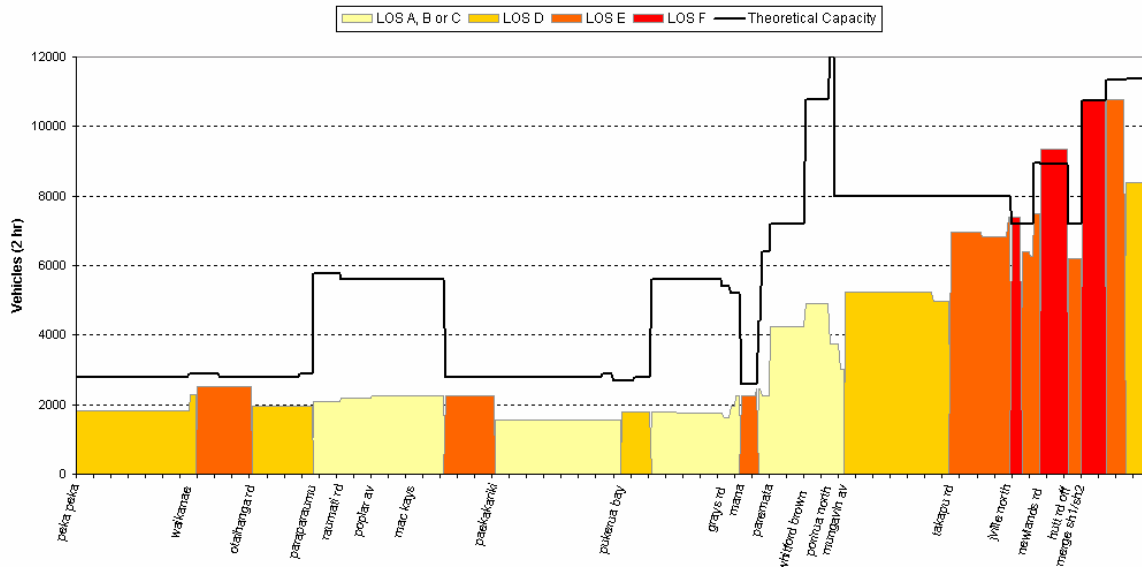
**Figure 2.1** and **Figure 2.2** show corridor capacity and 2016 demand by direction, together with an indication of Level of Service by section. It is interesting to note that congested sections of the corridor are consistent for both northbound and southbound traffic in the vicinity of:

- (i) Waikanae to Otaihanga;
- (ii) Paekakariki;
- (iii) Grays Road; and
- (iv) south of Johnsonville.

Therefore, localised works may be suitable for implementation in these areas. Further reductions in through traffic may have some benefit to the corridor as a whole, but outside of the above areas there is spare capacity.

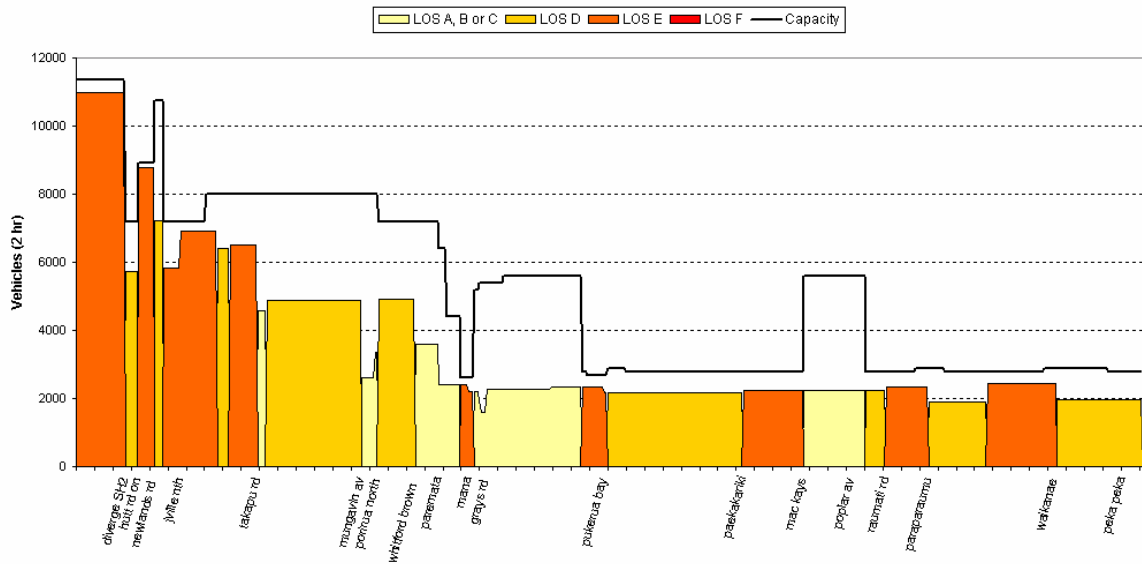


Figure 2.1 – 2016 Base Capacity and Traffic Volumes (Southbound), AM Peak Period (7am-9am)



Source: Western Corridor Transport Model, December 2004

Figure 2.2 - 2016 Base Capacity and Traffic Volumes (Northbound), AM Peak Period (7am-9am)

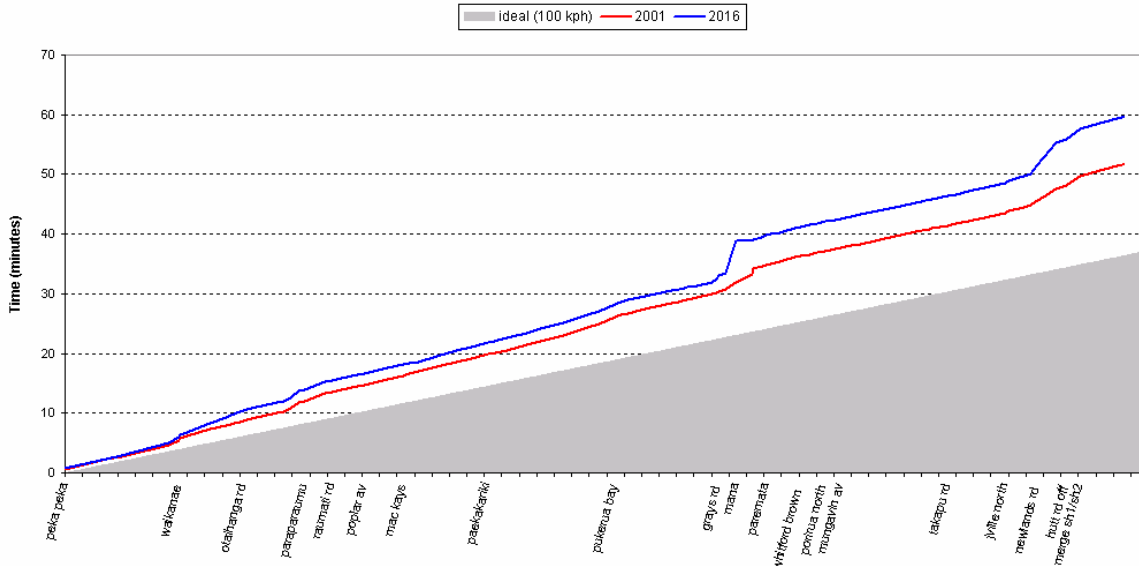


Source: Western Corridor Transport Model, December 2004

### Travel Time

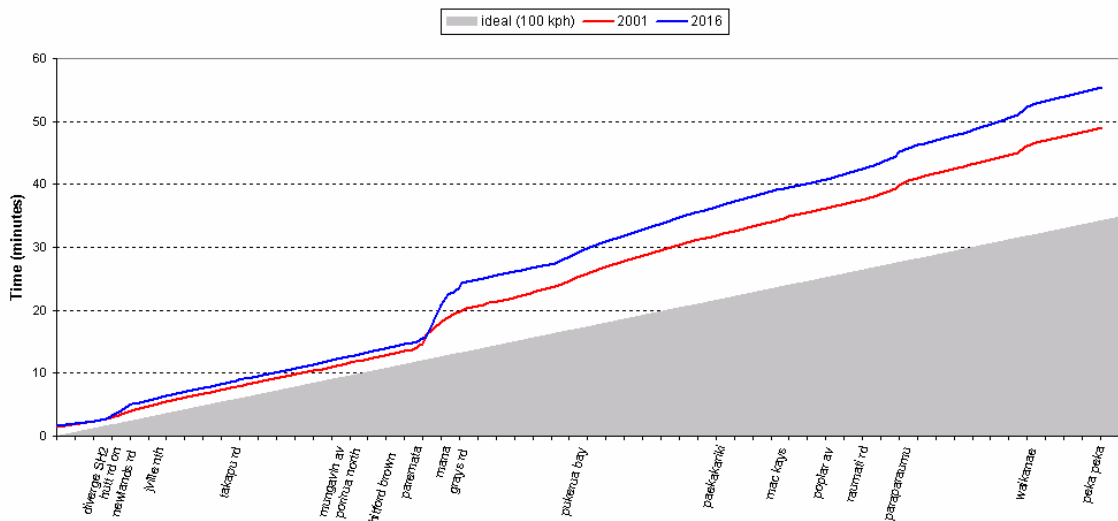
Figure 2.3 and Figure 2.4 show travel time along the corridor for 2001 and 2016 against an ideal theoretical travel time at 100kph. This information reinforces the earlier graphs, with congestion points affecting travel time at the four locations identified previously. Travel time is forecast to deteriorate over time without improvements. Greys Road contributes a significant amount of delay within the corridor.

Figure 2.3 – Travel Time against Distance (Southbound), AM Peak Period (7am-9am)



Source: Western Corridor Transport Model, December 2004

Figure 2.3 – Travel Time against Distance (Northbound), AM Peak Period (7am-9am)

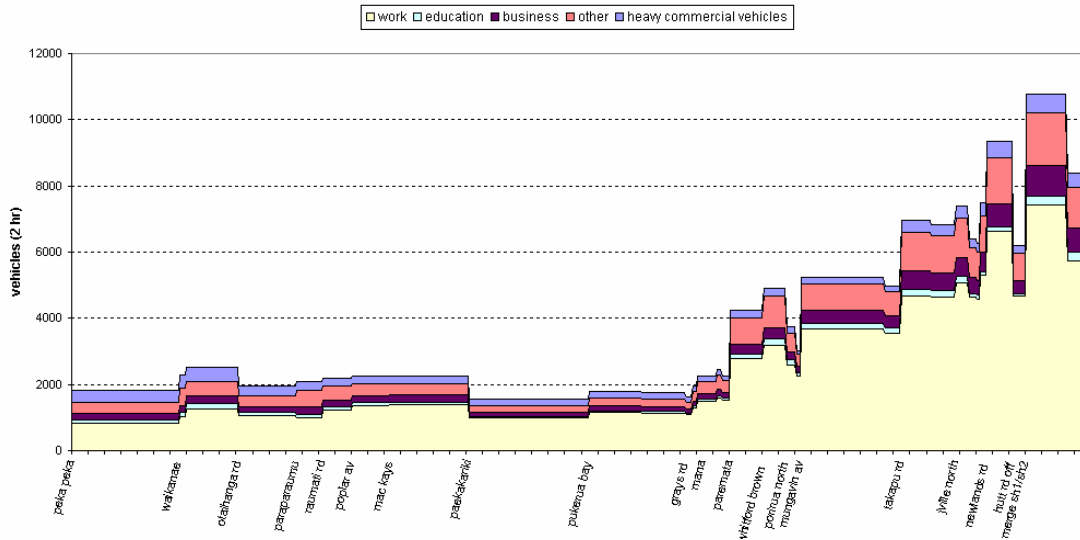


Source: Western Corridor Transport Model, December 2004

### Journey Purpose

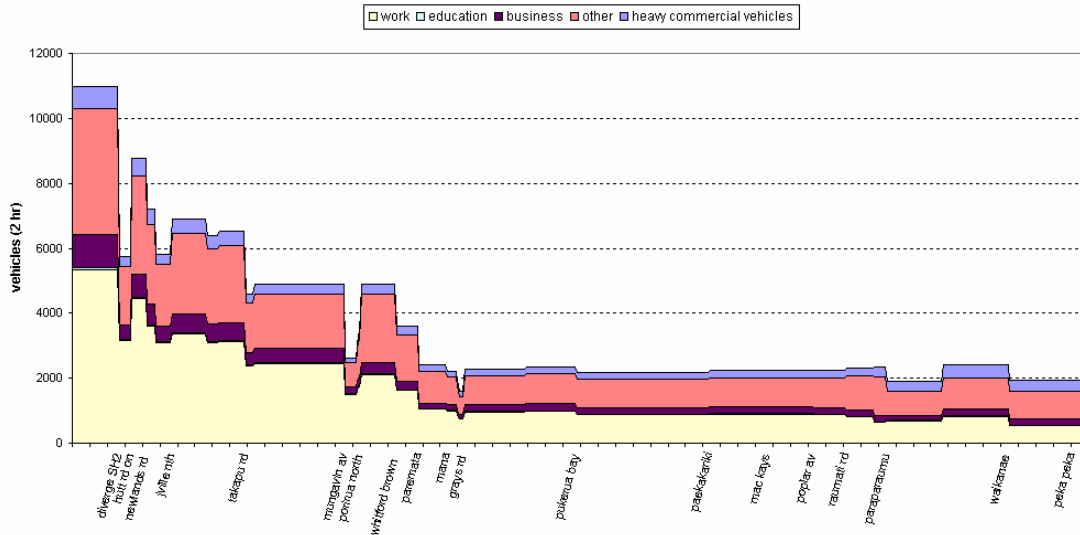
Having identified the key areas that may benefit from reduced travel demand, it is necessary to consider the trip purposes to identify opportunities to target particular types of traveller. **Figure 2.5** and **Figure 2.6** provide a breakdown of demand by trip purpose and corridor section. These figures confirm that the majority of the peak period travel demand is comprised of journey to work, which is comparable to other locations. Interestingly, there is only a small proportion of education based journeys.

**Figure 2.5 – Base Traffic Demand by Trip Purpose (Southbound), AM Peak Period (7am-9am)**



Source: Western Corridor Transport Model, December 2004

**Figure 2.6 – Base Traffic Demand by Trip Purpose (Northbound), AM Peak Period (7am-9am)**

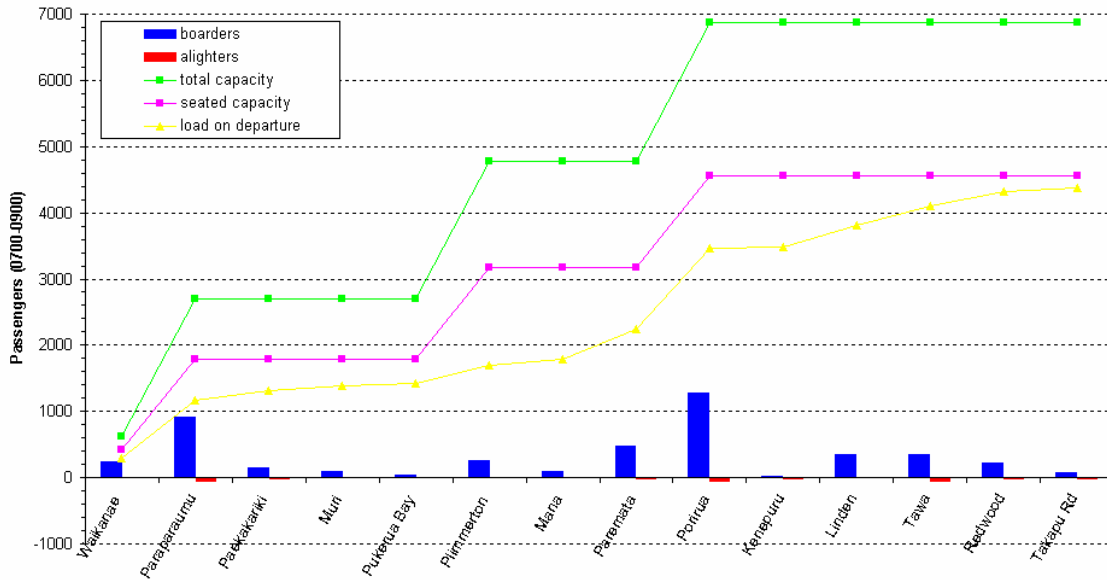


Source: Western Corridor Transport Model, December 2004

### Rail Demand

Figure 2.7 shows demand against capacity for rail trips within the Western Corridor, together with boardings and alightings. This information suggests that the rail corridor has sufficient capacity to cater for demands with excess capacity for much of the corridor, although the comfortable (seating) capacity is almost reached at the southern end of the corridor. The boardings and alightings information suggests that Paraparaumu and Porirua are the main focus stations within the corridor.

Figure 2.7 – 2016 Base Rail Passenger Demand and Capacity (Southbound), AM Peak Period (7am-9am)



Source: Western Corridor Transport Model, December 2004

### 2.3 Consideration of elements

Table 2.1 provides a discussion of potential measures that could be used to achieve these objectives in the Western Corridor and whether these are deemed suitable for further assessment.

**Table 2.1 – Consideration of Travel Demand Management Elements**

Strategy	Description	Indicators	Pursue?	Ability for GWRC to Implement
Alternative Hours – peak spreading	Providing the opportunity for employees to stagger their working times can help to offset peak period demands to the peak shoulders, or other times when networks have more spare capacity. This approach can also be applied to schools and other education institutions. Other opportunities include flexible working hours and compressed working weeks. Limited to a degree by the nature of the employment and location of schools / facilities.	1 - Percentage of peak hour trips by trip purpose. 2 - Number of school children in area. 3 - School start/finish times.	Yes	This approach is dependant on a number of different parties and would require a wider Government policy shift.
Bicycle Parking	Provision of bicycle parking at key locations can encourage increased rates of cycling through improved vehicle safety. In terms of a strategic corridor, such as the Western Corridor, opportunities to provide cycle parking at stations or other key destinations (schools, shopping, etc) should be explored to improve opportunities to use public transport for the ‘access’ leg of trips. Can be implemented through bike plans, and integrated with station upgrades.	1 - Existing supply. 2 – Existing demands.	Yes	Yes, this is a low cost initiative. Parking is provided at most stations and is managed by WRC. If a cyclist wants to park their bike, they must contact WRC for a key.
Bicycle/transit integration	As with the provision of cycle parking, integration of cycling and transport provides the opportunity for cycles to be used for	1 - Number of Cycle+Other mode trips. 2 - Cycle trip length.	No. Provision of parking supported by GW	N/A

Strategy	Description	Indicators	Pursue?	Ability for GWRC to Implement
	accessing public transport services for longer journeys (i.e. those beyond a typical 5km cycle ride). Examples include cycle racks on the front of buses in Queensland, cycle facilities on trains in NSW and in the UK, cycle booking systems (Anglia Trains)			implementation of cycle plans. The ability to take bikes on other modes is not a significant deterrent to cycling.
Bicycle Corridor	Provision of a trunk cycle route will help to create a trunk/feeder cycle network using the corridor for sections of the journey.	1 - O/D of cycle trips. 2 - Existing/proposed cycle networks. 3 - Review Council Bike Plans.	Yes	Yes, could be included as part of infrastructure.
Car Free Districts/Pedestrian Zones	Suited to dense urban centres, car free / pedestrian zones reduce the potential for vehicular/pedestrian conflict. Some instances of residential developments in the UK have precluded occupants from owning cars as a condition of purchase, with shared vehicles provided for occasional use. The benefits of such developments include a 'green' lifestyle choice and increase space for development without the need to provide for parking areas.	Limited potential for change in study area. The study area does not have enough support services to enable this to be implemented without social exclusion, impacts considered too intrusive. Local public transport is limited and likely to remain so, given population density and ability to support commercially viable services.	No	N/A
Car sharing	Car sharing is the process of purchasing or leasing a car as a group to reduce the total cost of ownership. Car share organisations	1 - Car ownership levels by area.	Yes	N/A



Strategy	Description	Indicators	Pursue?	Ability for GWRC to Implement
	<p>are beginning to form in Australia, providing the opportunity for members to use vehicles on a casual basis, paying on a mileage basis.</p> <p>This strategy reduces car ownership and encourages residents to use alternative modes for local trips. Will not necessarily reduce trips along the corridor.</p>			
Corporate Travel Plans	<p>Travel plans emerged from the US and UK, sometimes referred to as mobility management plans in Europe. In Australia they tend to be promoted under the TravelSmart banner (as a <u>voluntary</u> process), while in the UK they are legislated through the planning process.</p> <p>Travel plans include a range of travel demand techniques aimed at encouraging a mode shift for the journey to work or school.</p>	<p>1 - Businesses with &gt; 100 staff</p> <p>2 - Trip Length</p> <p>3 - Trip Purpose</p>	Yes	May require a change in legislation, or intensive marketing by Government. (reference Auckland model).
School Travel Plans	<p>Similar to corporate travel plans, education based travel plans include a range of techniques targeted to the needs of a particular school to encourage greater use of walking, cycling and public transport to school. The benefits of education travel plans include healthier, active children and are believed to assist in children's development by providing greater interaction with others</p>	<p>1 - School Population</p> <p>2 - Trip Length</p> <p>3 - Trip Purpose</p>	Yes	WRC will require a policy directive.

Strategy	Description	Indicators	Pursue?	Ability for GWRC to Implement
	<p>(although difficult to quantify).</p> <p>May reduce cross movements, particularly at Paraparaumu and Paremata Roundabout.</p>			
Congestion Pricing	<p>Road pricing through tolls has long been recognised as one of the most successful forms of influencing travel demand (linked back to the mode choice equation). However, it is also usually the least socially acceptable form of TDM and one that can be complex and political to impose. Road pricing requires suitable legislation.</p> <p>Many privately operated roads have tolls to recoup the cost of introducing the infrastructure. Privately operated tolls may not be viable in this corridor because patronage is unlikely to provide sufficient incentive to financiers.</p> <p>Any pricing will therefore be more likely introduced as a <u>congestion</u> based mechanism and could include: distance based pricing, time of day charges or some other scale.</p> <p>As a congestion based mechanism, the charges would be set by the public sector (GWRC) rather than through private</p>	<p>1 – existing patronage            2 – future patronage            3 – alternative routes/capacity            4 – willingness to pay/diversion effect</p>	<p>No. Given that tolling in a general sense will be addressed as part of another study, it is considered outside the scope.</p>	<p>Implementation would involve Transit or WRC and the costs in maintaining and operating a tolling system relative to likely patronage must be carefully considered.</p>

Strategy	Description	Indicators	Pursue?	Ability for GWRC to Implement
	investment.  It is possible that the private sector will manage the tolling infrastructure on behalf of government.			
Freight Transport Management	Road based freight transport is an essential element of any transport network, indeed the majority of network providers and maintainers are seeking to reduce demands for car travel to improve the viability of road based freight movements, which are affected by congestion causing significant costs to companies. Managing the impacts of freight transport in urban areas has social, economic and environmental benefits.	1 - Journey purpose. 2 - HGV proportions. 3 - Existing HGV routes. 4 - Growth in commercial land uses.	Yes	
HOV	High Occupancy Vehicle (HOV) lanes are another method of encouraging higher car occupancies by providing road space for vehicles carrying 2 or more people.	1 - Ratio of peak to peak shoulders. 2 - Trips by journey purpose. 3 - Car occupancy levels. 4 - Congested locations – bridges, pinch points.	Yes	Through infrastructure included in the corridor project.
Multi-Modal Access Guides	Providing information about travel to a building (workplace or education institution) can improve the number of people travelling by public transport by raising awareness of alternatives. Multi-modal access guides are typically a plan showing access by non-car modes that can be incorporated into	N/A	Yes	Yes, through a fairly simple marketing mechanism. To be implemented with bus/rail operators and Councils.

Strategy	Description	Indicators	Pursue?	Ability for GWRC to Implement
	marketing material such as business cards, invites and even email footers.			
Park & Ride	Park & ride facilities reduce vehicle kilometres travelled (vkt) by transferring drivers to a public transport mode for some of the journey, where a complete public transport journey is not possible or desirable.	1 - Metro entry points against spare capacity on rail networks/bus networks. 2 - Land availability. 3 - Opportunities for synergy with other parking areas. 4- Current utilisation.	Yes	Yes, as part of infrastructure package.
CBD Parking Restraint Policy	Parking availability and pricing is a major determinant in mode choice. Therefore, influencing the availability and pricing of parking at the trip destination is an important tool in the management of demand.	1 - Existing CBD parking capacity 2 - Existing CBD parking prices	Yes	
Pedestrian Improvements	All travellers are pedestrians for some part of their journey, even car journeys that include a walk trip to or from the vehicle. For non-car journeys this access leg of the trip becomes more important, with features such as weather protection and removal of impediments to travel such as steep inclines or stairs improving the mode choice equation.  Station upgrades – improve access to stations, passive surveillance, activity node.	1 - Number of short trips <1-2kms 2 – Review existing access constraints to stations. 3 - Provision of bus stop facilities & footpaths.  (potential for this to be a policy recommendation)	Yes	
Ride-sharing	Ride-share schemes aim to match people who have similar trip characteristics to increase car occupancy. They tend to be more effective	1 – Large institutions or businesses willing to participate in trial.	Yes	

Strategy	Description	Indicators	Pursue?	Ability for GWRC to Implement
	when introduced in areas with ‘known’ others, such as businesses, business parks, hospitals, universities, etc. rather than at the local level.			
Smart Growth	Smart growth is a term used to describe urban developments that are sensitive to travel demands, in particular focussing on the provision of public transport and encouraging walking and cycling.	2 - Limited new development occurring within the corridor, with limited potential to retrofit improvements to existing areas.	No	N/A
Speed differential between modes	Speed is intrinsically linked to travel times, which is a major determinant in mode choice. Reducing or managing car speeds while not penalising public transport travel times will increase the attractiveness of non-car modes. Lower speeds also have benefits in terms of road safety and could potentially lead to lower construction costs if a lower design speed is selected.	1 - existing design speed 2 - existing rail travel speed	Yes	
Street Reclaiming	Reducing the amount of carriageway provided for cars and providing additional capacity for pedestrians and cyclists is a function of supply management. Although not explicitly applicable to the Western Corridor Transportation Study, street reclamation may be possible within some of the centres along the corridor, should bypasses or alternative routes for corridor traffic be provided.	1 - Local streets used as strategic routes 2 - Local traffic volumes	No	N/A
Taxi Service	Taxis provide an alternative to cars for shorter	1 – Existing taxi usage	No	N/A

Strategy	Description	Indicators	Pursue?	Ability for GWRC to Implement
Improvements	trips. Improving reliability/permeation of taxi services could reduce need to travel by private car and reduce car ownership.	2 – Car ownership 3 – Taxi issues		
Teleworking/Telecommuting	Teleworking replaces the need to travel for some journeys. In the commercial context it is possible to replace some work journeys by teleconferencing, while it is also possible for some employees to work from home, completely removing the need to travel to work. In Sydney, the NSW Roads and Traffic Authority has established remote centres for staff travelling from the central coast and southern coast to reduce the need to travel into the CBD offices.	1 - PC ownership (access to IT) 2 - socio-economic information: occupation, prosperity, flexibility, age structure 3 - organisations able to provide remote offices	Yes	
Traffic Calming	Traffic calming can reduce the impacts of vehicular traffic by reducing speeds and noise impacts of traffic, while improving road safety. More suited to urban areas and areas affected by high volumes of fast moving traffic in residential areas.	1 - existing ‘rat running’ issues 2 - traffic flows on local streets 3 - local streets used as strategic routes	Yes	Would be a responsibility of local councils to implement.
Transit Oriented Developments – land use changes	Transit Oriented Developments (TOD’s) have emerged from the US over the last five years. The principle is based around concentrating high density developments at transit nodes, providing ample opportunity for passengers to use non-car modes for these journeys.	1 - growth proposals in urban areas near interchanges 2 - existing zoning and development controls	No	
TravelSmart (community planning)	IndiMark© and Travel Blending© are approaches to influence demand for travel at	1 - populations with high levels of car use	Yes	



Strategy	Description	Indicators	Pursue?	Ability for GWRC to Implement
	the household level. While both seeking the same outcomes the approaches differ. IndiMark© aims to increase the number of trips made by public transport for those who have the opportunity and inclination to change, while TravelBlending© seeks to reduce the need to travel by car while not reducing the mobility of the household. Both are forms of personalised travel planning.	2 - areas with redundant public transport capacity		
HOT Lanes	HOT lanes are a tolled variant of HOV (High Occupancy Vehicle) lanes. They offer free or reduced cost travel for HOV lanes and provide access for SOV (single occupancy vehicles) at market rates. They work well in high density corridors typical of larger metropolitan area with limited travel options and a lack of parallel highway routes. They can also improve the efficiency of corridors with newly created HOV lanes by supplementing HOV capacity with paying SOV's.	1 - potential market capture rates 2 - HOV lanes with redundant capacity	Yes	
Tidal Flow Lanes	Tidal flow lanes maximise capacity on constrained corridors with tidal flows by providing capacity in peak directions, without providing redundant capacity in the off-peak directions.	1 - constrained locations (capacity and geometry) 2 - demand vs capacity by direction at constrained points	Yes	
Bus priority at congested links	Bus priority is intended to improve the running speeds of buses, making the travel	1 - congested intersections (v/c ratios?)	No	N/A

Strategy	Description	Indicators	Pursue?	Ability for GWRC to Implement
	<p>time component better and improving service frequency and reliability (reducing the effects of congestion).</p> <p>There is no bus service along length of study area and if a service were introduced, would compete with the rail corridor. Any bus priority should therefore relate to feeder buses to the rail stations. Some bus-rail interchange currently occurs, particularly at the Paraparaumu heavy rail station.</p>	<p>2 - bus-rail interchange locations</p> <p>3 - slow running points in timetables</p>		
Improved bus/rail interchange facilities.	Improving bus/rail interchange will improve feeder services to rail for travel through the corridor.	<p>1 - review existing bus networks</p> <p>2 - review interchange opportunities</p>	Yes	
Increased frequency of rail services	<p>This outcome will occur because of rail infrastructure improvements. Existing train services operate between 4:30am to 11:00pm every day. Travel times between Wellington and Paraparaumu are around 55 mins and between Wellington and Porirua 20 mins.</p> <p>Between 9:30am to 3:30pm weekdays, Saturday and Sunday trains operate at 30 min intervals. Peak services at Porirua are 5 to 10 min (10mins pm peak). Paraparaumu, 20 mins during peaks.</p>	<p>This suggests that increased frequency is not as critical as increased reliability.</p> <p>These frequencies represent a reasonable level of service. In comparison, Auckland services run at approximately 20 minute intervals in the peak and hourly during the off peak and Sydney services operate at 3 to 15 min intervals during peak and 20</p>	No	N/A

Strategy	Description	Indicators	Pursue?	Ability for GWRC to Implement
		to 40 mins during the off peak.		
Incident Management	Not technically travel demand management but this is an appropriate solution for the corridor that is not reflected in other components.  Incident management will help reduce the delay that occurs when there is an incident.	1 - Number of incidents. 2 - Incident locations. 3 - Alternative routes.	Yes	
Traveller information	Not technically travel demand management but this is an appropriate solution for the corridor that is not reflected in other components.  Displaying anticipated travel times for congested routes provides drivers with the potential to find an alternative route, assisting in finding network equilibrium during congested periods.	1 - congestion points and frequency 2 - capacity on alternative routes	Yes	
Integrated ticketing	Integrated ticketing (sometimes referred to as smartcards) offers passengers the opportunity to pay for travel by swiping barriers. Although not reducing the payment interchange penalty altogether, it reduces the impact slightly and makes costs easier to apportion and manage between operators.		No	

## 2.4 Conclusions

Following consideration, the following elements have been identified as being suitable for further analysis. These are discussed in more detail in **Section 3**.

- Alternative Hours (Peak Spreading);
- Cycle Parking;
- Cycle Corridor;
- Corporate Travel Plans;
- School Travel Plans;
- Freight Transport Management;
- High Occupancy Vehicle Lanes;
- Multi-Modal Access Guides;
- Park & Ride;
- CBD Restraint Policy;
- Pedestrian Improvements;
- Bus Priority (Feeder Services)
- Improved Rail Frequency;
- Ride-Sharing;
- Speed Differential Between Modes;
- Teleworking/Telecommuting;
- Traffic Calming;
- Transit Orientated Developments;
- TravelSmart (Community Planning);
- High Occupancy Toll Lanes;
- Tidal Flow Lanes;
- Improved Interchange Facilities;
- Incident Management; and
- Traveller Information.

At this stage of the project, the following measures have not been deemed suitable for application in the Western Corridor and have not been considered further:

- Cycle/Transit Integration;
- Car Free Districts;
- Car Sharing;
- Congestion Pricing;
- Smart Growth;
- Street Reclaiming;
- Taxi Service Improvements;
- Bus Priority (Primary Route Services); and
- Integrated Ticketing.

It is important to remember that while some of these measures have not been selected for further analysis in this process they should not be discounted as poor ideas and should be kept in mind for future opportunities.

## **3 Review of Potential Effects**

### **3.1 Introduction**

Having identified the opportunities or measures that are likely to be suitable for implementation in the Western Corridor, this section considers each to establish (as far as possible) its potential for change.

As would be expected because of the innovative nature of this study, there are limited examples of these measures being implemented in a New Zealand environment and it has been necessary to reference international examples to supplement the data. Therefore, while every attempt has been made to focus the study to the Western Corridor conditions, a degree of caution does need to be given.

In preparing this report we have also reviewed the Greater Wellington Regional Council Regional TDM Strategy Issues Paper, dated April 2005, and the Transit New Zealand National TDM Progress Report, dated 22 February 2005.

### **3.2 Larger TDM Opportunities**

#### **Workplace Travel Plans**

Corporate travel plans have been used as a tool to reduce travel demand in New Zealand, Australia and internationally. They have been used for more than 10 years in the United States, United Kingdom and Europe where more information on their effects has been published. Travel Plans are being prepared in Auckland and some scope exists to introduce them within this corridor providing public transport services are available. The components of a travel plan could include:

#### Financial Incentives

Offering financial incentives for commuters to travel to work by non-car modes of transport is often a feature of a corporate travel plan. It can be an effective mechanism to encourage commuters to forgo their 'right' to park on-site for a day, week, month, year or even permanently (although the success rates are thought to be directly related to the length of the relinquishment and complexity of the scheme, with short-period simple schemes being more accepted and successful).

#### Guaranteed Ride Home

Guaranteeing a ride home (potentially provided by taxi services) is often an incentive provided to encourage participation in ride share schemes. This 'safety-net' provides for return travel for ride-sharers who for some reason are not able to ride-share (perhaps because the travel partner has had to change working hours, or is attending a site visit or meeting). This tool is often included in a corporate travel plan with a ride-share scheme.

#### Shuttle Services

Providing free or subsidised shuttle services for off-peak (for example, lunch time) trips to retail/transport hubs can reduce the need to own or use a car during the day.

Guidance of the likely effects of corporate travel plans in the UK<sup>1</sup> suggests that corporate travel plans have the potential to achieve between 7% and 12% reduction in car-based travel to work. Further guidance from the UK<sup>2</sup> found, from a survey of 20 workplaces, that the plans had achieved an average reduction of 18% in the number of commuter journeys made as car driver (median values were similar).

A review of the potential for workplace travel plans in New Zealand<sup>3</sup> investigated the results of a project initiated by Environment Canterbury, which developed travel plans for three workplaces in Christchurch, suggests a decrease in single occupancy vehicles of 4% and 16%, with longer term monitoring (not deemed statistically robust) finding a reduction of 14% in car driver trips. The authors consider that the decrease in car driver trips likely to be attributable to the plan to be in the range 6% to 8%.

In terms of take up, a survey undertaken in the UK in 2001<sup>4</sup> found that approximately 7% of businesses had implemented a travel plan. This has been achieved after extensive marketing and promotion and legislation through the planning system.

On this basis, there appear to be two important criteria that determine the likely potential of workplace travel plans to reduce demand in the Western Corridor – how many businesses are likely to take up travel plans? and what effect will those plans achieve?

It can be assumed at this stage that between 5% and 10% of businesses may develop a travel plan, with the lower estimate being more likely if the plans are marketed on a voluntary basis.

In terms of results, international and local evidence suggests that plans may achieve between 6% and 10% reduction in car trips. For application in the Western Corridor study, the trip purpose and length should be considered if this is to be applied to the model through a reduction in the car driver, employment trip purpose matrix.

### **School Travel Plans**

Internationally, school travel plans have been less well adopted than corporate travel plans due to a number of reasons including lack of resources and a wide variation in the need and purpose of the plans (such as overlap with Safe Routes to Schools schemes). There is also less information available regarding the outcomes of school travel plans, which could be a result of limited resources and incentive to monitor and maintain the schemes. This makes it more difficult to identify an accurate boundary for the likely outcomes that could be achieved in Wellington.

There are some existing proposals to work towards elements of school travel plans in the Wellington area, such as the Ridewell system (<http://www.wrc.govt.nz/rt/pickroute.cfm>), which is proposed to be updated to include a Student Resource Kit - information about public transport for use in school projects.

A further complication is that school trips tend to be shorter than commute trips and are less likely to use strategic routes such as the Western Corridor, making them less

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<sup>1</sup> Multi-modal studies: soft factors likely to affect travel demands, DoT, 2002

<sup>2</sup> Smarter choices: changing the way we travel, DoT, 2004

<sup>3</sup> Voluntary employer travel plans: can they work in New Zealand? Booz Allen Hamilton, 2003

<sup>4</sup> Multi-modal studies: soft factors likely to affect travel demands, DoT, 2002



attractive as potential for change in multi-modal corridor studies. With this in mind, research from the UK suggests that the perceived impact of school travel plans on travel to school by car could be as much as 30% (Hertfordshire local authority), while other estimates ranged between 10% and 20%<sup>5</sup>. However, these outcomes are more likely to be at the local level because of the characteristics of education trips.

It is likely that while school travel plans would have good results for pupil safety and health, and localised traffic congestion, they would have minimal effects on corridor traffic. If pursued, it could be assumed that an upper threshold for school travel plan take up would be in the order of 10%, but that results would be at the lower end of the spectrum at less than 10%.

Caution needs to be applied to reducing education trips in the model matrices, as these may also include secondary schools and universities. The outcomes above are more likely to be seen for primary (higher) and secondary schools (lower). Universities tend to be similar to (but still different from) workplaces in terms of travel behaviour.

A review of trip purposes through the corridor indicates that education trips form a very small proportion of peak period trips and therefore, given the further disaggregation into different types of education trips that could be influenced, it is unlikely that school travel plans would affect demand within the Western Corridor.

### **TravelSmart (Personalised Travel Planning)**

Community based travel planning, or personalised journey planning, evolved in Australia from earlier work undertaken in Europe. Personalised travel planning differs from corporate or school travel plans in that it aims to influence trip making at the origin, rather than the destination.

Two key processes have been developed internationally, including the IndiMark© approach from SocialData (Brog) and the TravelBlending© approach from Steer Davis Gleave (Ampt). The approaches differ in their outcomes and aims, with the IndiMark© process focussing on public transport ridership increases, while the TravelBlending© approach focuses on achieving more sustainable travel patterns at the household level (not necessarily through mode shift).

A significant amount of information has been published about the outcomes of these two processes, although little information is published about the pros and cons of the actual processes as both are trademarked by their respective developers. This makes it difficult to investigate the location specific factors behind the processes to see if they will translate well to the Western Corridor.

The Indimark© approach appears to work well in areas with low public transport usage, but with spare public transport capacity as it is aimed at educating the public about their travel choices. The TravelBlending© approach appears to work well in areas with strong community groups.

A review undertaken in the UK suggested that the approaches could reduce car use nationally by up to 2billion/vkt per annum (based on 25% of households in 50% of

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<sup>5</sup> Multi-modal studies: soft factors likely to affect travel demands, DoT, 2002

residential areas) at a cost of £100m, while **Table 3.1** provides a summary of the major international applications<sup>6</sup>.

From this information it appears that outcomes of between 7% and 15% reduction in car driver trips have been achieved in the target populations, with lower (2% to 6%) results in more rural areas. Research from the Nuremberg and Kassel individualised marketing projects suggested that shopping and leisure trips accounted for the majority (70%) of behaviour change. It could be inferred from this finding that personalised journey planning would have less of an impact on the journey to work and therefore peak hour congestion.

In terms of application for the Western Corridor, this is perhaps a longer process that would need to be trialled to ascertain the likely actual outcomes for local conditions. However, the sensitivity of the demand to changes could be estimated by reducing the car driver matrices for various trip purposes from localised areas that have redundant public transport capacity, such as Paraparaumu or Porirua where public transport includes both heavy rail and buses.

**Table 3.1 – Personalised Journey Planning Outcomes**

Location	Size of programme	Car driver mode share before	Car driver mode share after	Fall in car driver trips*	Source
South Perth (suburb of Perth, Australia)	15,300 households / 35000 people	60	52	-14%	Brög (2002)
Nürnberg (Germany)^		44	38	-14%	UITP (undated)
Goteburg (Sweden)	large scale			-13%	James (2003b)
Viernheim (Germany)	large scale			-12%	James (2003b)
Brisbane (Australia)	Pilot			-10%	James (2003b)
South Perth (suburb of Perth, Australia)	Pilot			-10%	James (2003b)
Portland (USA)	Pilot			-8%	James (2003b)
Kassel (Germany)^	not known	48	44	-8%	UITP (undated)
Viernheim (Germany)	Pilot			-8%	James (2003b)
Cambridge (suburb of Perth, Australia)	9400 households / 24,000 people	60	56	-7%	James (2003a)
Marangaroo (suburb of Perth, Australia)	10,000 people			-4%	James (2003c)
Breisgau-Hochschwarzwald (Germany) ~	not known	44	43	-2%	Socialdata (2003)
Emmendingen (Germany) ~	not known	44	43	-2%	Socialdata (2003)

\* Note that this figure is not calculated from the two previous columns, but is drawn separately from the available source data.

^Pilots in Nürnberg and Kassel used an early prototype of the IndiMark methodology, which has been developed considerably since.

~ Projects in Breisgau-Hochschwarzwald and Emmendingen had the objective of increasing public transport use, not reducing car travel

Source: Smarter choices: changing the way we travel, DoT, 2004

<sup>6</sup> Smarter choices: changing the way we travel, DoT, 2004

## Freight Transport Management

Improvements could be achieved through transferring some road based freight movements to rail. Currently freight/passenger conflicts occur on the rail line with reliability impacts for both users, however associated improvements in the rail corridor could address this issue, particularly as freight movements are unlikely to coincide with peak commuter times.

Other options explored as part of the infrastructure assessment include passing tracks or relocation of all freight movements to the Hutt Corridor. However, a measurable reduction in freight movements by road is not considered likely due to a probable split towards interurban freight trips rather than long distance freight trips. It is more than likely that a high percentage of freight trips are intended to serve the suburban area alongside the corridor. It would be impractical and costly to transfer these trips to rail.

Commercial vehicles form a fairly high proportion of demand through the corridor, and the sensitivity of the model in terms of demand can be made by apportioning some demand from road to rail. This is an issue that should be considered through the rail study.

## Park & Ride

Park and ride facilities provide the opportunity for mode change between cars and another mode for some of a journey. Most often this is to rail, although buses do form organised park and ride links in some instances. The concept behind park and ride is to provide a parking facility in an unconstrained area on the edge of a constrained area (cbd), with a connecting transport link to the constrained area. Park and ride facilities therefore tend to be provided on the outskirts of urban centres providing for car access from lower density areas hard to service by public transport, into a transport corridor that is well served by public transport.

Existing park and ride spaces on the rail line are shown in **Table 3.2**. Anecdotal evidence suggests that these spaces are well-utilised, which may indicate latent demand for increased numbers of spaces. Paremata, Porirua and Paraparaumu are the key park and ride stations along the rail line.

**Table 3.2 – Existing park and ride stations**

Station	Existing Spaces	Station	Existing spaces
Wellington	-	Paremata	298
Kaiwharawhara	-	Mana	20
Takapu Rd	110	Plimmerton	35
Redwood	130	Pukerua Bay	25
Tawa	70	Muri	5
Linden	-	Paekakariki	82
Kenepuru	-	Paraparaumu	425
Porirua	350	Waikanae	54
		<b>Total</b>	<b>1604</b>

Source: Maunsell Wellington, December 2004

Park & ride facilities need to be carefully designed in terms of safety and security. Ideally these facilities should be integrated with active land uses to ensure high levels of passive surveillance. They also need to be connected to activity nodes. The design of

existing park and ride facilities is poor, for example at Porirua, a stream divides the train line, park and ride and town centre. At the Paremata Roundabout station, the car park is isolated between the highway and the rail line.

Park and ride facilities are likely to be suitable for the primary urban areas along the corridor, in the first instance linking into the existing rail corridor. There is likely to be further potential to provide park and ride facilities within the corridor to act as collector points from the adjacent more rural areas. The number of parking spaces available should be considered carefully at all stations, particularly with regard to peak service frequencies. For example, Paraparaumu park and ride also supports Waikanae residents as there is only one peak hour service from Waikanae and limited parking spaces available. While a number of options are being looked at (new station at Lindale, electrification to Waikanae), these options are considered expensive with limited real benefits.

It should be kept in mind that an undersupply of park and ride spaces is likely to discourage infrequent and potential rail commuters due to no alternative transport modes being available.

A review of rail capacity and demands suggests that the existing rail network has sufficient capacity to cater for additional demands from amplified park and ride facilities. This has been modelled on a sensitivity basis, increasing park and ride capacities by 20% with an appropriate shift from road to rail.

Modelling results for 2016 (with a 20% increase in park and ride capacity) against a 2016 base suggests the following:

- 3-4% increase in public transport trips during the weekday AM and PM peaks;
- 1% decrease in car driver trips during the weekday AM peak;
- decrease (up to 35%) in public transport trips north of Paraparaumu indicating that with improved facilities at Paraparaumu there is a transfer of trips from Waikanae rather than new public transport trips transferring from car.;
- 4-6% increase in public transport trips crossing screenlines between Paekakariki and Johnsonville during the weekday AM and PM peaks;
- 2-3% decrease in car driver trips crossing screenlines between Paekakariki and Johnsonville during the weekday AM peak;

Comparing park and ride modelling results against network improvements in the Waikanae / Paraparaumu area (Waikanae Extension, new Raumati station and Waikanae electrification plus new rail Lindale station) identifies the following:

- Park and ride produces the largest increase in public transport trips in the AM and PM peaks;
- Public transport trips between Waikanae and Paraparaumu increase significantly (between 2 and 4 times) with the Waikanae extension and the Waikanae electrification and new station at Lindale, however this equates to about 100 - 120 additional passengers in the AM and PM peak hour's.

- Benefits of these 2 options to the remaining passenger network south of Paekakariki are considerably less substantial (e.g. 5-7% increase between Paekakariki and Pukerua Bay dropping to between 2-3% south of Porirua);
- The new rail station at Raumati has minimal impact on mode shift across the corridor.

### **CBD Parking Restraint Policy**

Parking strategies include changing the mix of public parking types (long-stay/short-stay), work place availability and the pricing (1-2 hours cheap, 3 or more hours expensive). The objectives are to maintain the economic viability of centres for retail trade and industry, while reducing opportunities for long stay commuter parking.

Increasing the cost of parking in comparison to the cost of viable public transport alternatives is one of the primary disincentives for managing travel demand as this is one of the largest aspects of generalised cost. A CBD study is currently being undertaken to identify a parking strategy for Wellington and this should be considered in a holistic manner with the Western Corridor strategy.

The CBD study is currently addressing opportunities to introduce a parking policy. For the purpose of this study, it is appropriate to assume a 20% increase in parking costs to test the impact on the Western Corridor. The mechanism to achieve the percentage change will be determined as part of the CBD study.

A 20% increase in CBD parking charges was applied. The modelling results follow:

- 2% increase in public transport trips in the weekday AM and PM peaks, across the whole study area;
- Negligible decrease (<1%) in car driver and passenger trips across the study area.

This would suggest that there may be an oversupply of long stay parking in the CBD and that a 20% increase in charges would be met by demand for those spaces. It is also considered that parking restraint is more likely to reduce the attractiveness of car driver trips from Wellington City suburbs (i.e. those that do not use the Western Corridor) as the relative price of public transport trips decreases in relation to private vehicle use. Providing adequate public transport alternatives are provided it is recommended that long stay parking spaces become less attractive to the commuter, either through availability or through pricing. In this regard, price increases of over 20% should be considered.

### **Car Sharing (Car Clubs)**

Local car share schemes have been trialled in a number of locations, including recently in Sydney and Melbourne. These schemes aim to reduce car ownership and car availability by permitting participants to borrow cars and pay for the time that they use the car for, drastically reducing overhead costs. A scheme currently operating in the UK has doubled membership in the past 8 months (late 2003 – mid 2004), with more than 70 vehicles and plans to expand in London, Edinburgh, Bristol and Brighton<sup>7</sup>.

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<sup>7</sup> Local Transport Today, 1 July 2004

Car clubs tend to work well in dense urban areas with high levels of public transport accessibility, where owning a car is a realistic choice. In these areas, the primary mode of transport to work tends to be public transport, with car club members using cars for occasional trips.

Therefore, while appropriate to influence an increased awareness of the need for car restraint and opportunities for reduced car ownership, it is unlikely that car clubs would have a significant effect on peak hour travel demands in the Western Corridor.

### **Incident Management**

Anecdotal evidence suggests that part of the route is closed about every two months creating excessive delays, indeed one of the key historic drivers for Transmission Gully has been to provide an alternative route in case of an incident.

Road safety improvements are considered a given in the base case which is likely to reduce the severity of incidents but perhaps not the frequency. However, incidents are not always related to crashes, particularly at Paekakariki where landslips are common.

An incident management program is likely to include automated incident detection, improved emergency response times, planned alternative routes, traveller information or other measures.

The Ngauranga Gorge introduced an incident detection system in 2001 that allows for early notification of an incident to emergency services and the use of variable message signs to advise motorists. In the case of Western Corridor, these signs could also direct drivers to the nearest rail station. The various stakeholders that are likely to be involved in incident management (Police, Transit, emergency services, tow trucks and environmental/pollution management services) would already have clear communication lines and protocols and these could be extended to the Western Corridor with the inclusion of rail and bus operators.

Any improvements to incident management will not be evident in a typical peak hour model but will have some benefits when expansion factors are applied to determine annual delay.

## **3.3 Modelling Opportunities**

### **High Occupancy Vehicle (HOV) Lanes**

HOV lanes tend to be implemented in congested areas on corridors (such as bridges), where the improved travel time of the lane encourages higher vehicle occupancies and thus reduces the total number of vehicles while not restraining demand.

These features could be modelled through estimating the likely use of the HOV lane (through surveys of car occupancy), and factoring demand for these links accordingly. Applications of this technique in Sydney found that the HOV lane on a busy entry to Sydney had almost as high demand as the adjacent uncontrolled lanes. Illegal use of HOV lanes also needs to be factored in and this tends to be quite high, due to current limitations in electronic enforcement.



### High Occupancy Toll (HOT) Lanes

High occupancy toll lanes are HOV lanes that can be accessed by low occupancy vehicles for a fee. This arrangement makes the most of redundant capacity (should it exist), while recouping funds towards infrastructure costs. Lane prices are variable and are managed to maintain free flow conditions, even during peak periods, on a willingness to pay basis.

A simple approach for estimating HOT demand and revenue is:

- (i) Estimate HOV use based on known number of multi-occupant vehicles in traffic stream/
- (ii) Use current Level of Service to estimate average remaining vehicle capacity in HOV lane for free-flow conditions.
- (iii) Calculate Level of Service in general lanes and determine reduction in vehicles per hour to achieve free-flow condition.
- (iv) Calculate vehicle hours of congestion delay in general lanes during HOV operation against free-flow conditions.
- (v) Calculate total 'cost' of congestion delay using value of time, average vehicle occupancy and income distribution.
- (vi) Set HOT toll at average cost of congestion delay for vehicles in general lane. 'Shift' vehicles out of general lane into HOT lane up to available excess capacity of HOV lane.
- (vii) Calculate HOV revenue.<sup>8</sup>

### Modelling Latent Demand

The sensitivity of the network to a reduction in home based work trips can be modelled by reducing these trips by 2%, 5% and 10%. It would be expected that a reduction in car driver and car passenger trips should be relative to the percentage of work based trips on the network. The results indicated the following:

- a 5% reduction in home based work trips resulted in a 1-2% reduction in car driver and car passenger trips in the weekday AM and PM peaks;
- a 10% reduction in home based work trips resulted in a 1-5% reduction in car driver and car passenger trips and a 2% reduction in public transport trips in the weekday AM and PM peaks;
- mode share shifted 1% in favour of public transport.

This suggests that there would be significant latent demand for private vehicle trips, and that reducing the number of home based vehicle trips would free some road capacity, only to be filled by other vehicles (some from annual growth on the network but most from 'other' trips).

This implies that marketing or behavioural approaches to reducing traffic should be complemented by enforceable approaches such as HOV or HOT lanes. These regulatory approaches should act to discourage the shift from public transport modes should spare road capacity at peak times become available.

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<sup>8</sup> A Guide for HOT Lane Development, US Department of Transportation

### **Speed Differential Between Modes**

The effects of constructing a lower standard/speed corridor should be weighed up in terms of multi-modal demand by using lower speeds for the road based links while maintaining full speed rail. This may have some mode choice benefits and lower construction costs (and accident risk benefits), although rail transit times may also increase over existing journey times if more stations are added to the corridor. Slowing car travel is more likely to be acceptable in instances where adverse safety conditions exist that result in unnecessary levels of speed related accidents.

### **Tidal Flow Lanes**

In order to minimise construction costs, it may be possible to construct some elements of the Western Corridor as tidal flow lanes, with the peak hour direction having more capacity. These areas could be identified through the design review, or if not suitable be removed as a recommendation from this assessment.

The key element to providing a tidal flow system is that adequate road space (i.e. at least three lanes) must exist in order to be able to increase capacity in the peak direction. The cost of maintaining the system over time should be measured against the cost savings in providing one or two less lanes. The main area that would benefit from a tidal flow system as a lower cost alternative is the coastal section from Paikakariki to Waikanae, however unless the existing bottlenecks are resolved (road narrowing at Paekakariki, level crossing between Paekakariki and Paraparaumu and traffic signals in Paraparaumu and Waikanae) congestion will merely be transferred, and overall benefits will be minimal.

### **Bus/Rail Interchange**

Bus rail interchange currently occurs at Waikanae, Paraparaumu and Porirua. Discussions with bus operators indicate that there is very little interchange between modes, particularly at Paraparaumu.

#### Waikanae

Three services operate at Waikanae (75, 76, 77) linking Coastlands shopping centre with the station and Waikanae beach north and south. These services have a 30min frequency and are timetabled to meet the train at Paraparaumu station.

#### Paraparaumu

Five services operate from this interchange in addition to the Waikanae services. One route travels directly to Paekakariki. This service runs Monday to Friday but only has one service at 10am and one at 1:30pm and is operated by Paraparaumu taxis.

Route 71 and 72 link the station with Paraparaumu beach travelling through the local streets. Services operate in conjunction with trains at 30 min intervals. A trip between the station and the beach takes approximately 20 mins. Route 74 links the station with Raumati. This service operates hourly during the off peak period and half hourly during the peaks.

#### Porirua

Nine services interchange at Porirua including a route that links to the Johnsonville rail line. This provides an alternative route to Wellington although has a journey time



approximately double the equivalent train time on the Western rail line. Routes 68 and 69 service the area west of the rail line and run at 30 min intervals whilst routes 61 to 67 service east of the railway line including Ascot Park, Waitangirua, Castor Crescent, Sievers Grove and Ranui Heights.

Services have various frequencies: route 61 (Ascot Park, Waitangirua) 15 mins; route 63 and 64, 30 mins; route 62 and 67 hourly; with the remaining only operating in peaks

For interchanging services, timetables coincide between rail and bus but assume reliable on time running. Discussions with Kapiti Council indicated that the train unreliability is impacting on bus services, particularly when bus drivers are not informed of the magnitude of any delays.

Timetables are well advertised with most bus routes including train times at the station they connect with as well as arrival and departure times for Wellington.

In terms of improving conditions for interchanging passengers, opportunities include:

- better co-ordination between buses and rail when there are delays;
- traveller information to inform passengers of delays;
- improved rail reliability which will in turn improve bus reliability; and
- improved comfort facilities including seats, weather protection, supporting commercial such as newsagent or coffee/drinks stands.

Improving interchange facilities through better design, integration of modes, mode frequency and coordination or even design can reduce the penalty experienced in the generalised cost calculation for mode choice.

Opportunities to improve interchanges could be investigated for the major stations along the line experiencing high levels of boarding and alighting, such as Paraparaumu, Paremata and Porirua as shown in **Figure 3.1**.

As discussed above, feeder services already operate at the major population centres. Frequencies are reasonable for most routes although the routes to Whitby operate during peaks only and taxis operate the route to Paekakariki. There may be some opportunity to improve services by introducing a demand responsive system. This will reduce off peak delays for trips within each of town centres (primarily Porirua and Paraparaumu) although will not improve peak hour journeys since the bus timetables are linked to the frequency of the rail.

Whilst all these facilities improve the travel experience for passengers, they are unlikely to increase rail patronage. The benefit in improving comfort for passengers is to maintain existing patronage levels.

This could be modelled by varying penalties in mode choice equations to transfer trips between public transport and car driver matrices.

### 3.4 Other TDM Opportunities

The following opportunities are likely to have less effect on travel demand, but should still be considered as part of a consolidated package of measures.

### **Alternative Hours (Peak Spreading)**

Traffic surveys indicate that the demand profiles within the corridor have defined peaks, which suggests that the potential exists for benefits through peak spreading to encourage people to travel outside of the core peaks, to the shoulders. This will reduce peak hour volumes while making use of redundant capacity.

Some potential opportunities for peak spreading include offsetting school opening times (although it is appreciated that education trips are likely to be local and have smaller effects through the corridor). Other opportunities include encouraging flexible working hours and staggered office hours for workplaces and Government departments.

### **Bus Priority (Feeder Services)**

While bus priority on primary route bus services are not considered consistent with the objectives of this report, bus priority on feeder services to rail stations has the potential to encourage mode shift towards rail. While these bus trips comprise the secondary mode in a multi-modal journey, any undue delay through poor road design / inadequate signal phasing and congestion with commuter traffic will decrease the attractiveness of the whole journey. Bus priority would only be considered where existing road conditions warrant the money spent and the time saving benefits. The most probable benefits are more likely to be received around the larger suburban areas and busier interchanges. Bus access points in and out of interchanges should take particular priority over normal road traffic.

### **Pedestrian Improvements at Modal Interchanges**

Improving access and movement throughout stations and modal interchanges will help to increase patronage and reduce interchange penalties for multi-mode trips. Improvements such as clear and defined pedestrian walkways with free movement between modes will help to establish patronage at new and upgraded interchanges and improve patronage over time. These measures should be considered as part of the rail / bus interchange improvements package.

### **Cycle Parking**

A review of key stations along the corridor should be undertaken to identify latent demand for cycle parking. Cycles locked to poles or other street furniture close to the station often indicate that there is latent demand for facilities that may be released. Encouraging cycling to stations increases the catchment areas and hence patronage. Cycle parking should be considered as part of bus / rail interchange improvements.

### **Cycle Corridor**

Providing a cycle corridor along the Western Corridor may be beneficial as a structural 'backbone' to local cycle plans, although due to the distances, predominant weather conditions and topography it is unlikely that cycling will be a competitive mode at the corridor level. A cycle corridor is more likely to provide synergy between adjoining local authorities (and their bike plans), and encourage cycling as a valid mode choice between parts of the corridor (e.g. between Porirua and Paremata) rather than between the suburban corridors and Wellington City. At a local level cycle lanes are more likely to be used as feeder routes to increase access capacity to stations and local public

facilities such as schools and hospitals. At this level cycling needs to be assessed in terms of access and facilities provided at modal interchanges.

### **Increased Service Frequency**

Little opportunity exists to increase the attractiveness of rail without considering non-rail demand measures. In this case increased rail capacity or increased service quality does not necessarily lead to a modal shift away from cars. However, it is recognised that increased service frequency can add to the attractiveness of a public transport journey and provide opportunities to increase patronage. In larger metropolitan cities, particularly those with light rail or underground networks, service frequencies can be as often as two to three minute services during peak periods. While service frequency would normally respond to patronage growth, it is considered that the western corridor (as a fairly basic service provider) would experience a shift towards rail if the experience met or exceeded expectations for those commuters that infrequently use the service or may be considering more frequent use.

### **Transit Oriented Development**

While transit oriented development is a medium to long-term solution to travel demand management, the strategic land use planning for implementation over time should be presently established. In many metropolitan centres throughout the world major transit nodes are synonymous with high-density residential development. In established and expanding centres these nodes are extending along the arterial transport routes and intensifying in density. Strategically these nodes should be planned for prior to network improvements, i.e. while the land is still available and relatively cheap. It is envisaged that the nearest interchanges to Wellington City could initially be established as high-density residential nodes.

It is considered that market demand for this type of development outside of Wellington City is likely to be volatile and more strategically consistent with faster growing population bases. However, it should be kept in mind that Wellington City is very compact and is likely to be restricted in terms of land availability for medium and high-density residential development in the future, particularly as immediately surrounding suburbs are not characteristically consistent with higher density residential development.

### **Traffic Calming**

Traffic calming projects should be designed and implemented by local councils to take advantage of redistribution in traffic from local roads as a result of the corridor. Local roads benefiting from reduced traffic volumes may be identified from the model results and targeted for works.

### **Teleworking/Telecommuting**

A teleworking trial was undertaken by the Greater Wellington Regional Council in 2003. The 12 month pilot program aimed to reduce the number of people travelling from the Kapiti Coast to Wellington City by working from home or using the Kapiti TeleCentre, which is enabled with internet access.

The effects of teleworking and telecommuting have been reported in a variety of studies including:

- Travel time/distance reduced by 4-8% (Home Office Partnership Study, Cambridge, 1997)
- -0.3% of all travel on motorways/trunk roads, 2% of peak hour volumes (SDG, IT)
- long term potential for -5-12% reduction in car use through teleworking (Review of teleworking in Great Britain, 1995)

The general recommendation suggests that telecommuting and teleworking could reduce demand by around 2% of peak hour trunk route volumes (Dr James Luk, AARB).

### **Traveller Information**

Traveller information is provided on Melbourne's Freeway system and provides motorists with estimated travel times to major cross roads. It enables drivers to make a route decision based on clearer information. In the case of the western corridor, traveller information may assist in transferring some car trips to rail if there is heavy congestion. As well as traveller information for road based travel, dynamic arrival times for trains may also provide some benefits. Traveller information could be introduced as part of the incident detection mechanisms.

## **3.5 Non – TDM Measures**

### **Local Road Improvements**

A number of road upgrades have been identified within the coastal region of the corridor with the aim of reducing peak hour congestion at bottlenecks and problematic intersections. Generally speaking road capacity improvements will increase the attractiveness of car-based trips, however, can also improve public transport patronage (primary bus route or bus feeder trips) providing journey benefits are allocated to these transport modes (i.e. bus priority measures).

However, modelling results on these measures suggest negligible mode shift either way over the study area. Effects are very localised, with a general shift towards car driver and car passenger trips and away from public transport.

## **3.6 Priced TDM Elements**

Priced TDM measures have not been considered in this report. but it is considered that they will be able to further reduce traffic volumes. Current legislation limits the availability of these measures and changes to legislation are not expected in the next ten years.

Toll roads may be constructed in New Zealand where there is a free alternative. Some road elements that duplicate the current corridor may provide opportunities for tolls. Tolls are unlikely to obtain significant revenues where little time gains are obtained but may be able to be applied for TDM purposes. Toll opportunities should be considered when the infrastructure investment parts of the corridor plan are better established.

### 3.7 Summary

The modelling indicates that application of these measures is likely to have limited effect on the traffic volumes on the corridor. It is expected that a suite of these measures may reduce corridor volumes by up to 5%. The application of these measures would best be trialled on the corridor to determine which are the most effective.

Analysis of the effectiveness of a major TDM feature scenario, Scenario 1 – TDM and Public Transport, was assessed to be insufficient to address the full needs of the corridor. Therefore TDM will be used to support other infrastructure based scenarios to provide the desired level of peak hour flow below that which the infrastructure investment provides.

From the assessment and evaluation of non price TDM measures considered in this report, it is recommended that the final package of measures should include the following:

- Park and Ride
- CBD Parking Restraint
- Bus / Rail Interchange
- Bus Priority (Feeder Services)
- Increased Service Frequency
- Workplace Travel Plans
- High Occupancy Vehicle (HOV) Lanes

Priced TDM measures have not been considered in this report but it is considered that they will be able to further reduce traffic volumes. Current legislation limits the availability of these measures and changes to legislation are not expected in the next ten years. Toll opportunities should be considered when the infrastructure investment parts of the corridor plan are better established.